On the Extinct Emeu of the Small Islands off the South Coast of Australia and probably Tasmania.

SOME of my colleagues in Australia, as I gather from "Notes" in NATURE (vol. lxxv., pp. 228, 467), have lately been at work on the identification of the small emeu of the islands in Bass Strait and Tasmania, now extinct. Prof. Baldwin Spencer, of Melbourne, having examined the bones of the emeu which once lived on King Island and found them smaller than those of *Dromaeus ater* of Kangaroo Island, has felt justified in proposing a name for that bird, and has called it *D. minor*. Colonel Legge, an old colonist, has also been working on the King Island emeu, and proposed for it a name, which, however, he withdrew in a postscript to his paper in favour of Prof. Spencer's one already published. From memory, having seen a pair in his boyhood, Colonel Legge considers the Tasmanian emeu a distinct *small* species.

Now I believe that the question of the emeus of small size which about a century ago yet lived in Tasmania and on the small islands off the south coast of Australia can only be settled by a careful comparison of their bones, and then, and then only, shall we know whether one or more species lived on those islands. I do not know of the existence in museums of specimens, either mounted skins or skeletons, of well authenticated Tasmanian emeus, but we possess two authentic skeletons and two mounted specimens of *Dromaeus ater* (Peron), which in the first years of last century was abundant on Kangaroo Island; two of these four specimens are in Paris, one is in Florence, and one in Liverpool. Mine is a skeleton, and is one of the three brought alive to France by Peron in 1803 from l'Ile Decrès (Kangaroo Island) (NATURE, vol. lxii., p. 102; *Ibis*, 1901, p. 1); the Liverpool specimen is, I think, not located; it is undoubtedly *D. ater*, but might hail from King Island or even from Tasmania; it may be the lost "lesser emea" of the Bullock Museum, dispersed in 1819.

I may now add that last summer my friend Mr. Alexander Morton, director of the Tasmanian Museum at Hobart, sent me some bones of the small emeu which he had collected on King Island, in Bass Strait, asking me to compare them with the corresponding bones of the skeleton of *D. ater* in this museum. I did so at once, aided by Prof. E. Regàlia, a high authority on ornithic osteology; the result of our careful comparison was that, barring some slight differences of purely individual value, the remains of the three specimens from King Island examined *were absolutely identical* with the corresponding bones of Peron's specimen from Kangaroo Island. I therefore wrote to Mr. Morton (from whom I have not heard since) that I had not the slightest doubt that *D. ater* (Peron) once lived on King Island, and unless new evidence should show the contrary, I am much inclined to favour the hypothesis that the same diminutive emeu once lived in Tasmania. HENRY H. GIGLIOLI.

Royal Zoological Museum, Florence, March 29.

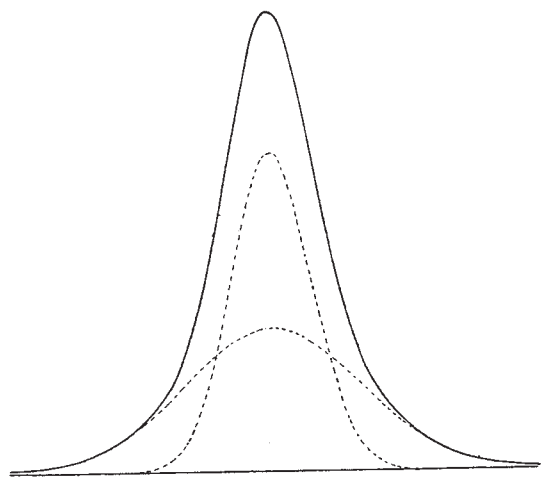
Mean or Median.

THE two applications of the *median*, suggested in Mr. Galton's letter (NATURE, February 28) and his article (March 7) respectively, seem to me to be somewhat distinct.

In the case of a jury or committee voting as to a sum of money to be given, there is no question of truth, but only of expediency. If any amount be proposed and put to the vote, the proposition will (by the ordinary way of voting) be defeated so long as that amount is above the median; the process of voting tends, therefore, to give an amount *not greater than* the median. Mr. Galton's suggested procedure is in this case, it seems to me, quite correct, and a saving of time would be effected if the problem were consciously approached from his standpoint.

The case of averaging a series of estimates with the view of arriving at objective truth appears to be on a different footing. If there is a considerable sprinkling of fools or knaves amongst the estimators, or of persons with a tendency to bias—as the buyers and sellers might be in judging the weight of cattle, according to the suggestion of Mr. Hooker—the question as to choice of means is one that is difficult to answer. The important question is, in fact, not the "probable error," but the probable *bias*, for the whole frequency distribution may centre round an entirely erroneous value. If, on the other hand, the observers are honest and unbiassed, the choice of average turns on the form of the frequency distribution; we require that average which is (1) least erroneous, as a rule, (2) least subject to fluctuations of sampling—two conditions which may very well conflict. As regards (1), psychologists, following Fechner, suggest the geometric mean, I believe, as the best. But the distribution of guesses given by Mr. Galton does not appear to follow the law of the geometric mean; if it did, the median should be less, not greater, than the arithmetic mean. Further, so far as one can judge, the geometric mean would give a value as much too low as the median is too high. Looking at the distributions in Prof. Pearson's memoir on errors of judgment (Phil. Trans., 1902), there seems very little to choose between the mean, the median, and the mode; sometimes one is the best and sometimes another.

As regards (2), the probable error of the median has been discussed on several occasions by Prof. Edgeworth (*Phil. Mag.*, 1886, 1887; Camb. Phil. Trans., xiv., 1885). The value is $0.674 \ldots /2h\sqrt{n}$, where h is the true ordinate of the frequency distribution at the median, *i.e.* $1/\sqrt{2\pi.\sigma}$ for the normal curve. For the normal distribution, therefore, the probable error of the median is greater than that of the mean in the ratio of 1·25 : 1, approximately. For a flatter topped curve with more curtate tails the ratio of probable errors is greater than 1·25 : 1, and accordingly for all such distributions the arithmetic mean is the better form of average. But for a curve with a high central peak and long tails, the probable error of the median may be less than that of the mean, and it will be the more stable form of average. As an illustration, Prof. Edgeworth has taken the case of a distribution compounded of two superposed normal curves with the same means and numbers of observations; if the standard deviation of the one is to that of the other in ratio greater than 2·236 : 1, the median has a lower probable error than the mean. The figure shows the critical distribution for which the probable errors of mean and median are the same.



In the absence of definite knowledge as to the frequency distribution of estimates in any specific case, it does not seem to me that any confident judgment as to choice of means can be given. G. UDNY YULE.

March 26.

Golden Carp attacked by a Toad.

THE following account of a toad attacking a golden carp may be of interest to some of your readers from its bearing on an ancient belief that frogs and toads are at enmity with carp, and kill them by destroying their eyes. Izaak Walton in the "Compleat Angler" refers to this belief,

and states that frogs attack carp by "sticking fast" to their heads. Possibly naturalists, unknown to me, may have already thrown light on the origin of a tale which hitherto I have regarded as a fisherman's story of the conventional type.

On March 29 my son directed my attention to a large golden carp (*C. auratus*) lying in shallow water near the edge of a pond in my garden with a frog or toad apparently resting on its head. The fish appeared to be very sluggish, and made no attempt to escape from a landing-net with which it was easily brought to shore. On examination it was found that the head of the fish was held tightly by a medium-sized common toad (*Bufo vulgaris*), which had obtained a very firm grasp by inserting its fore-limbs as far as the second, or elbow, joint into the sockets of the eyes of the unfortunate fish. The ghoulish-looking toad lay on the top of the fish's head facing its tail, and with its hind legs hanging in front of the fish's mouth. At first the appearance of the eyes of the fish led me to think they had been ruptured, but closer examination showed they were merely displaced and turned partially round owing to the pressure exerted by the intrusion of the toad's limbs between the eyes and their sockets.

On carefully withdrawing the toad's fore-limbs, which were inserted to the extent of about 1 inch within the eye-sockets, the eyes returned to their normal position apparently uninjured, but during their displacement the fish must have been quite blind. No effort of the fish could have rid itself of the toad after it had once obtained the remarkably firm grasp which has been described, and it appears very probable that the fish would have died in a short time. How the toad in the first instance obtained a hold in the sockets of the fish's eyes appears very puzzling, but a probable reason for its attempt to obtain a grasp, and for it holding on when a grasp was obtained, may perhaps be found in the unreasoning instinct which toads appear to possess at spawning time of grasping something firmly with their fore-limbs. A few years ago in the same pond referred to above I found a toad embracing a water-logged puff-ball so firmly that it required considerable force to release the fungus from the amphibian's grasp.

ADRIAN J. BROWN.

Birmingham University, April 2.

The Atomic Weight of Nickel.

IN a recent number of NATURE (February 14, p. 367) Dr. Barkla gave reasons, based on experiments in connection with secondary Röntgen radiation, for assigning to nickel a new atomic weight. Dr. Barkla studies the penetrating power of secondary Röntgen radiation, shows that it depends on the atomic weight of the element, and from the values found for nickel, in comparison with those found for copper and iron, he argues that nickel appears to have the atomic weight of 61·3 instead of the usually accepted value of 58·7.

Prof. McClelland (Trans. Roy. Dub. Soc., vol. ix., part i., 1905) showed that the intensity of secondary β radiation from different elements for the same exciting primary β rays depended on the atomic weight, and that a small difference in atomic weight could be detected in this way. According to Dr. Barkla, nickel has an atomic weight somewhat greater than cobalt, instead of the value, slightly less, given by chemists. If this were so, the intensity of the secondary β radiation from nickel should exceed that from cobalt.

I have recently repeated the observations of Prof. McClelland, using a very sensitive apparatus. Cobalt and nickel gave practically the same secondary radiation; if there is any difference, that given by cobalt is slightly the greater. The values found for these elements, compared with those obtained for copper and iron, correspond with their relative positions in the table of atomic weights. These results obtained with secondary β radiation do not, therefore, point to the conclusion suggested by Dr. Barkla, and are in good agreement with the chemical determination of the atomic weight of nickel.

F. E. HACKETT.

University College, Dublin.

Light Sense-Organs in Xerophilous Stems.

IN view of the recent work of Haberlandt on the light sense-organs of leaves, it may be of interest to record the discovery of similar organs in xerophilous stems. Certain of the epidermal cells of the young stems of the Ephedreæ have on their external wall conical structures of the nature of papillæ, the core of the papilla being mucilaginous. This structure acts as a collecting lens focussing the incident rays of light, and a definite area of the cytoplasm of the back wall of the cell is thereby illuminated. Fig. 1, which is a photomicrograph taken

FIG. 1.—*Ephedra Altissima* showing Light Spots.

in diffuse light of a mounted preparation of epidermis, shows the appearance of these light spots as seen under 1/6 objective.

Of any object held in the path of the incident rays an image is formed by each of these light sense-organs.

Fig. 2 is a similar preparation to Fig. 1, but shows in each light spot the image of a hand held at a distance of about 2 feet in front of the microscope.

In the xerophilous Ephedreæ, where the assimilatory work is performed by the stems, and in correlation with

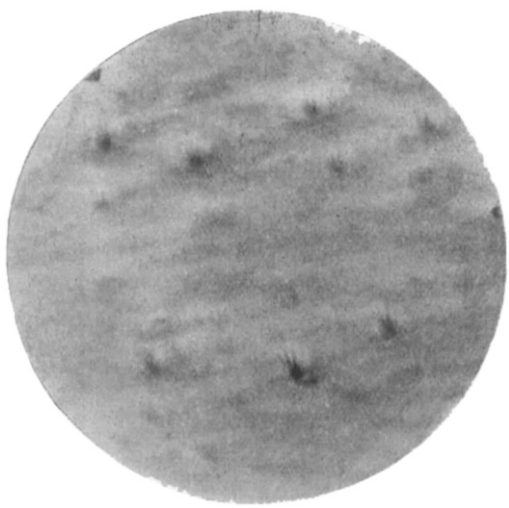


FIG. 2.—*Ephedra Altissima* showing image of hand in each Light Spot.

which the histological character of the cortex is markedly similar to that found in the mesophyll of a leaf, the existence of such structures as these light sense-organs so characteristic of leaves is not by any means unexpected.

An examination of other stems is in progress.

R. J. D. GRAHAM.

Botanical Department, University, St. Andrews, March 26.